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SEASONAL FLIGHT OF THE CRANBERRY GIRDLER[1] DETERMINED WITH PHEROMONE TRAPS[2,3]

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Abstract.—The seasonal flight of the cranberry girdler, *Chrysoteuchia topiaria* (Zeller) was monitored with pheromone traps for 3 years. Daily trap captures averaged at 5-day intervals were a better indicator of seasonal flight than single-day catches. Peak flight occurred at different calendar dates but was close to the mean summation of heat units (857°C degree-days) for 3 years. More than 90 percent of the flight period occurred within 30–35 calendar days. Even though pheromone traps measured both flight activity and population density, a combination of pheromone trap data and cumulative heat units provided a reasonable estimate of the seasonal abundance of adults, excluding data obtained during periods of cool rainy weather.

The cranberry girdler, *Chrysoteuchia topiaria* (Zeller) occurs throughout North America in habitats that vary from coastal cranberry bogs to high mountain parks. The sex pheromone of this polyphagous feeder has provided a new way to monitor the seasonal flight of adults (McDonough and Kamm 1979; Kamm and McDonough 1980). The extent to which trap captures reflect population density is unknown because various factors influence the number of insects captured in pheromone traps, e.g. weather, population density, and various behavioral modes of the insect (Lingren et al. 1981). Unlike many moths, the cranberry girdler is diurnal and weather conditions during the day also influence the number responding to pheromone traps.

The accumulation of heat units (degree-days) is also useful in monitoring insect populations (Sevacherian et al. 1977). Since temperature is known to have a major influence on diapause development of the cranberry girdler (Kamm 1973), heat unit summations may also have value in monitoring

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[1] Lepidoptera: Pyralidae.

[2] Contribution of Agric. Res. Serv., USDA in cooperation with the Agric. Exp. Sta., Oregon State Univ. Technical Paper No. 5744 of the latter.

[3] Mention of a commercial or proprietary product in the paper does not constitute an endorsement of this product by the USDA.

girdler populations. The present paper describes the seasonal flight period of the cranberry girdler determined with pheromone traps in relation to daily weather and heat unit summations.

Materials and Methods

Tests were conducted near Corvallis, Albany, and Woodburn, Oregon, in commercial seed fields of Kentucky bluegrass or orchardgrass infested with a natural population of the cranberry girdler. Procedures and methods for preparing the test baits are described elsewhere (Kamm and McDonough 1980). Pherocon 1C traps were baited with natural rubber septa that contained 1.0 mg (*Z*)-11-hexadecenal and 0.05 mg (*Z*)-9-hexadecenal.

The flight period of adults was monitored with 6 pheromone traps deployed throughout each field. Traps were serviced daily in the weather study, and trap catches for 5 consecutive days were averaged each calendar day of the flight season to obtain a moving average. Otherwise traps were serviced 2 or 3 times weekly, and trap captures were averaged every 5 calendar days during the flight season. Light intensity was measured at 0900 daily with a General Electric light meter, and 3 classifications of sky conditions were established: (1) Cloudy—total cloud cover, 26–28,000 foot candles (fc); (2) Partially cloudy—39–50,000 fc; and (3) Sunny—66–67,500 fc. Since the calling period of females occurs primarily between 0700–1100 (Kamm 1974), sky conditions during the afternoon were disregarded. No light intensity values fell between established classifications.

Temperature data were obtained from the Oregon State University weather station. Wintering prepupae of the girdler were capable of some development at 10°C, and 5.5°C was considered the developmental threshold (Kamm 1973). Daily heat units (degree-days) were computed by adding the maximum and minimum temperature, then dividing by 2 and subtracting 5.5°C.

Results and Discussion

Daily weather and trap capture of males during the flight period is shown in Fig. 1. Substantial day-to-day variation in trap capture occurred throughout the flight period that could be attributed to weather. For example, trap captures during rainy periods were considerably less than captures made during favorable weather that preceded the rain. Notice also that trap catch was reduced on cloudy or partially cloudy days when preceded by a sunny day. Weather clearly exerted a dominant influence on trap catch, and therefore trap catch on any given day may not provide a reasonable estimate of population density. Such variation in trap catches is believed to be the rule rather than the exception.

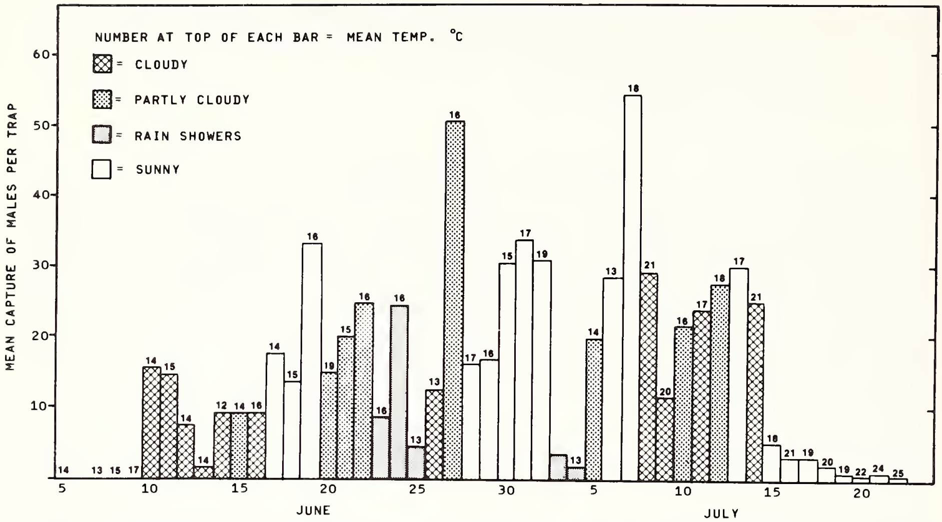

Fig. 1. Weather records and pheromone trap catch of male cranberry girdler in a commercial seed field of bluegrass.

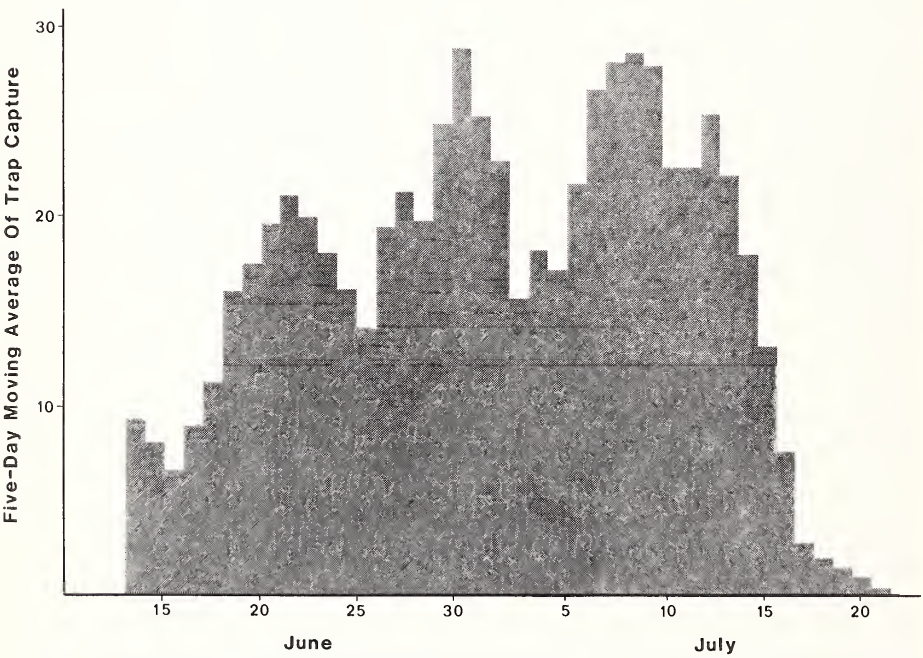

Fig. 2. Five-day moving average of seasonal pheromone trap catch of male cranberry girdler.

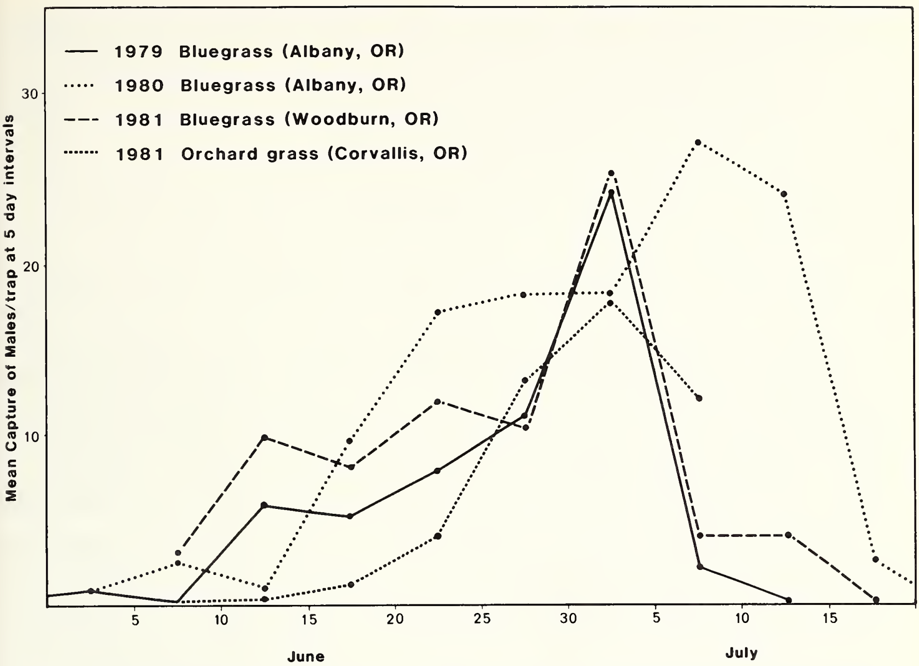

Fig. 3. Seasonal flight of the cranberry girdler in 4 fields in different years and locations.

Daily variation in trap data (Fig. 1) can be reduced by computing a 5-day moving average (Fig. 2). The resulting histogram closely approximates seasonal abundance and duration of the flight period determined with light traps (Crawford and Harwood 1964). Even though pheromone traps measured both flight activity and population density, the traps provided a reasonable estimate of seasonal abundance except when trap catches decreased during the two periods of cool rainy weather (near June 24 and July 3).

Fig. 3 shows the adult trap captures in 4 fields in different years and locations when trap captures are averaged every 5 calendar days. Notice that populations peaked July 1–5 in 1979 and 1981 and July 5–10 in 1980. The cumulative heat units since Jan. 1 for each year at peak flight were:

Year	Date of peak flight	Cumulative heat units °C at peak flight
1979	July 1–5	877
1980	July 5–10	847
1981	July 1–5	849

The mean cumulative heat units for the 3 years was 857, and peak flight in all three years occurred remarkably close to the mean. Peak flight for each of the three years would be close to the mean summation of 857 heat units even though peak flight occurred on different calendar dates. Notice also that 90 percent of the moths were captured in each field over a period of 30–35 days. The decline of the adult population may be accelerated when fields are windrowed for harvest by elimination of canopy shelter. However, none of the bluegrass fields was windrowed for harvest before July 11, and in 2 of these fields the population had declined drastically before windrowing.

Information about population density in advance of larval damage is difficult to obtain, and often the stand of grass is damaged before the infestation becomes noticeable. Since pheromone traps measure both flight activity and population density, it is nearly impossible to forecast precise population density with 90–95 percent accuracy. Nevertheless, we feel a combination of pheromone trap data and cumulative heat units provides a useful estimate of population density during the flight period. For example, by June 10, 1979, 1980, and 1981, the cumulative heat units were 631, 551, and 577°C, respectively. Therefore, the 1980 population would be expected at a later calendar date than the 1979 and probably the 1981 population. With this information, trap data obtained after June 10 should indicate about when the population will peak and whether the population is sparse, moderate or dense, excluding data gotten during cool and rainy weather.

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